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UNITED STATES DEPARTMENT OF AGRICULTURE.
BUREAU OF BIOLOGICAL SURVEYHINTS ON RAISING QUAIL.
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Although numerous experiments in the artificial propagation of quail have been made in the United States, much remains to be learned before methods can be recommended which will insure success. Following is a compilation of the methods used by experienced breeders of quail who have published accounts of their work.

The proportion of young reared by the most successful experimenters rarely exceeds from 30 to 50 per cent of the total number of eggs laid. The greatest difficulties thus far experienced are connected with securing satisfactory breeding stock, that is, birds that are strong, tame, and free from disease; and caring for the young so as to keep them in good health. Breeding birds should not be placed in coops or pens that have been used for chickens or turkeys, nor should they ever be kept on ground that has been used for domestic poultry.

Cages.

In the construction of cages or runs two lines of procedure have been followed. Large permanent cages have been used, and while they insure protection from enemies, they are more expensive and make it necessary to gather and bring to the cages much green food, and weeds, etc., for their seeds. Small cages are favored by most breeders. They are less expensive and are easily moved, but they result in greater losses from natural enemies. All cages should have the walls, up to at least 2 feet from the ground, made of boards, or else of 1-inch-mesh poultry netting lined with tarred paper. This keeps the chicks from escaping; they readily go through inch mesh. It also prevents the birds from taking fright at dogs outside the cages, and foils cats which otherwise would catch young quail coming near the wire. The tops of all cages should be covered with $\frac{1}{2}$ -inch-mesh netting. (This size used to keep out weasels.) The walls of permanent runs must be continued into the ground, about a foot, and it is better to have the buried portion flare outward at the bottom. Brush or box shelters are necessary, and a part of each run should be enclosed, except the side toward the south, so that shelter from storms and a dry dusting place may be had at all times. When large permanent runs are built, they should be in pairs, one of which will be in use while the other is burned over, or limed, spaded, and sowed to grass, clover, buckwheat, lettuce, and the like. If small cages are used, they can be moved about from time to time on pastures or on cultivated land sown as above described.

Breeding.

Quail should be kept in pairs, one pair to a pen. If the birds are in good health and the eggs are gathered systematically, leaving at least two nest eggs, from 30 to 50 eggs should be obtained from a single female. Some have produced 100 eggs in a season. Records of the number of eggs per pair, and of the percentage of fertile eggs, should be kept, so that the best breeding stock can be selected.

Hatching.

Hens, preferably bantams, or incubators may be used for hatching. Good hens are preferable as they require less attention than an incubator. Some hens kill the young quail as soon as hatched or later eat their feathers, so that eggs should be removed to an incubator or chicks to a brooder as soon as hostile acts are noticed. The period of incubation is $23\frac{1}{2}$ days. The temperature of an incubator should be kept at 105° F. More moisture should be supplied than is recommended for eggs of fowls, and longer cooling periods should be allowed.

Care of Young.

Brooder system.--Remove chicks from incubator as soon as dry, put in a darkened brooder at 105° F., and let them have a good long sleep. When they begin to run about and call, give them access to a mixture of fine grit, granulated bone, fine oyster shell and charcoal in equal parts, and clean water in a very shallow vessel. The brooder should be kept--

From 1st to 5th day at 100° - 105° F. (103° F. at night).

" 5th to 15th " " 95° - 100° F. (95° F. " ").

" 15th to 30th " " 95° F. " " "

During this last period the brooders should be open by day, allowing the chicks to leave if they wish. Brooders must be scrupulously clean. Scrub thoroughly, disinfect with formalin, and fumigate both brooder and the bed of pine needles, dried grass, straw, or other litter, with sulphur. The brooders must have no chinks or cracks into which the little quail can crawl. A tray of carefully dried, fine loam should be provided for dusting.

Bantam hen system.--When little quail are to be left in charge of a bantam hen they are first confined with their foster mother in a run of half-inch-mesh netting for about a week until they learn to follow the hen and respond to her calls. They are then placed on the rearing field, the hen in a slat fronted coop and the quail free to run at large. The broods must be confined in the coops with the hens at night. Breeding cages must be constantly shifted to fresh ground.

Feeding.

The young do not need food for at least 24 hours after hatching. The first meal may consist of a netful of insects swept from weeds, or some well-cleaned maggots; some begin with custard. For the first 10 days about six meals per day should be provided. Bulky and less nutritious foods should be alternated with concentrated ones. Sour curds (quite dry); a custard prepared with two eggs to a pint of milk, and an ounce of shredded wheat, or bread crumbs; berries of the season; maggots; and meal worms are all suitable for this period. The chicks should have a full meal of maggots or meal worms the last thing in the day. Weed seeds and small grains should gradually be increased in the diet, and green food such as clover, lettuce, etc., is very desirable. As the birds mature, berries of all kinds and larger grains may be fed, but they should always have an allowance of animal food. Dry bread crumbs mixed with hard-boiled eggs also are used, changing as the birds grow

to prepared pheasant meal. Food should never be allowed to become stale. A supply of fresh water is always necessary; it must be kept shaded and cool.

Winter feeding.

The openings of shelters should face south, and the center of the cage should have one or more brush piles. Weed seeds (furnished by throwing in the whole plants) and grain mixtures are good food, and an apple, cabbage, or other vegetable should be placed where the birds can peck at it. Water should be supplied when snow is not available.

Liberating.

Quail hatched early in summer should be fit for liberating in late fall. Later broods should be kept through the winter. Patches of buckwheat, planted near or upon the rearing fields, tend to hold the birds in the locality.

Diseases.

For treatment of various quail diseases see Farmers' Bulletin 390 issued by the United States Department of Agriculture.

REARING MAGGOTS AND MEAL WORMS FOR QUAIL.

Rearing Maggots.

The system of maggot rearing followed at the Massachusetts Hatchery is to place fly-blown meat in inclined barrels, and as the maggots hatch and consume the meat, to add a fresh supply, putting in dry sandy loam as freely as is required to absorb the moisture and keep them covered. If the number of maggots is not large they will grow in the barrel until ready for use, when they will crawl out and drop into a box underneath. If they are crowded they will crawl up vertical surfaces and escape. At such times dust should be used freely. When grown they are screened into another box and given a liberal supply of fresh sand for scouring, which they do by squirming unceasingly until they change into the pupal stage. It is very necessary to reserve a liberal number of maggots to change into breeding flies, and this is rendered difficult at times by the activity of the agencies that keep flies in check. At times there is an abnormal increase of a small ichneumon fly, a parasite on the meat fly, that destroys them in the pupal stage. The maggots reserved for the adult stage must be covered up to protect them from this fly.

Rearing Meal Worms.

Dr. C. F. Hodge says: Directions in the bird books for raising meal worms are quite misleading, and in order to go to work intelligently we must learn the life story from egg to egg. The first fact to learn is that the insect is single brooded, that is, it requires an entire season

to complete its growth. The beetles may be found laying eggs from May until freezing weather in the fall. The early eggs will produce larvae that are full grown by September or October of the same season, and larvae from the late eggs do not attain their growth until about midsummer of the next season. A female beetle lays from twenty to fifty eggs. While practically any farinaceous material -- corn meal, ground feed, cracker crumbs, bread crusts -- is suitable, feeding experiments have proved that wheat, in some form or other, is preferable and yields the best specimens. Fill a tight box or earthen jar half full of the food material, put in scraps of old leather, cover with woolen cloths, and have a lid of wire screen. Put in a few hundred larvae or beetles and leave undisturbed, except to insert a raw potato from time to time. If this be done about April, a good supply of larvae will be obtained for use the following fall, winter, or spring.

